day 51

3.10/72

differentiate implicitly $\cos(\cos^{-1}(x)) = x$

$-\sin(\cos^{-1}(x)) \cdot \frac{d}{dx}(\cos^{-1}(x)) = 1$

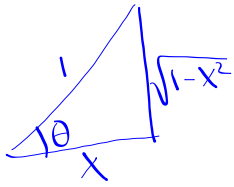
* so $\frac{d}{dx}(\cos^{-1}(x)) = \frac{-1}{\sin(\cos^{-1}(x))} = \boxed{\frac{-1}{\sin(\theta)}}$

but what is

Recall: $\cos^{-1}(x)$ is "the angle whose cosine is x"

Lets call it θ

so $\cos(\theta) = x$

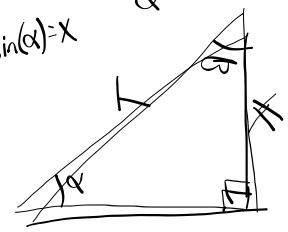


* $\sin(\theta) = \sqrt{1-x^2}$

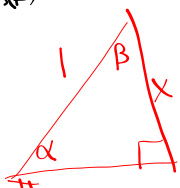
$\frac{d}{dx}(\cos^{-1}(x)) = \frac{-1}{\sqrt{1-x^2}}$

72b Use $\underbrace{\sin^{-1}(x)}_{\alpha} + \underbrace{\cos^{-1}(x)}_{\beta} = \frac{\pi}{2}$

$\sin(\alpha) = x$



$\cos(\beta) = x$



diff imp

$\sin^{-1}(x) + \cos^{-1}(x) = \frac{\pi}{2}$

$\frac{1}{\sqrt{1-x^2}} + \frac{d}{dx}(\cos^{-1}(x)) = 0$

$\frac{d}{dx}(\cos^{-1}(x)) = \frac{-1}{\sqrt{1-x^2}}$

OOPS

$\cos^{-1}(\cos(x)) = x$

$\frac{d}{dx}(\cos^{-1}(x))\Big|_{x=\cos x} \cdot \frac{d}{dx}(\cos x) = 1$

$\frac{d}{dx}(\cos^{-1}(x))\Big|_{x=\cos x} (-\sin x) = 1$

$\frac{d}{dx}(\cos^{-1}(x))\Big|_{x=\cos x} = \frac{1}{-\sin(x)}$

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$$\lim_{x \to 0} x\csc(x)$$

$$= x \frac{1}{\sin x}$$

Not $x \sin^{-1}(x)$

Nor $x \frac{1}{\cos x}$

Nor ...

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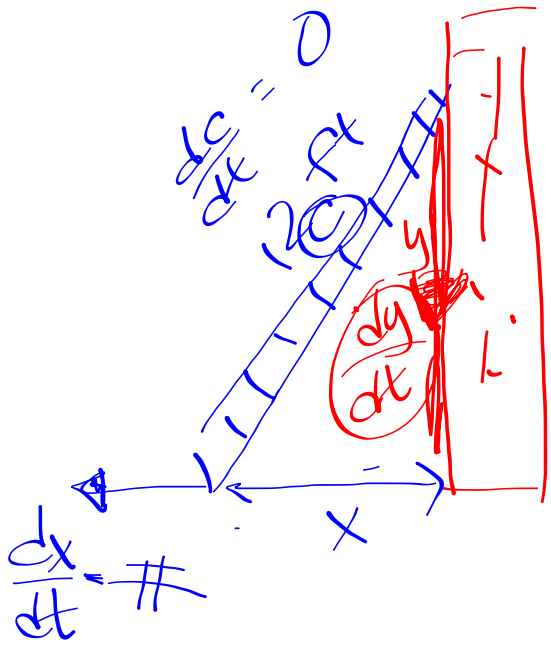

$x^2+y^2=12^2$

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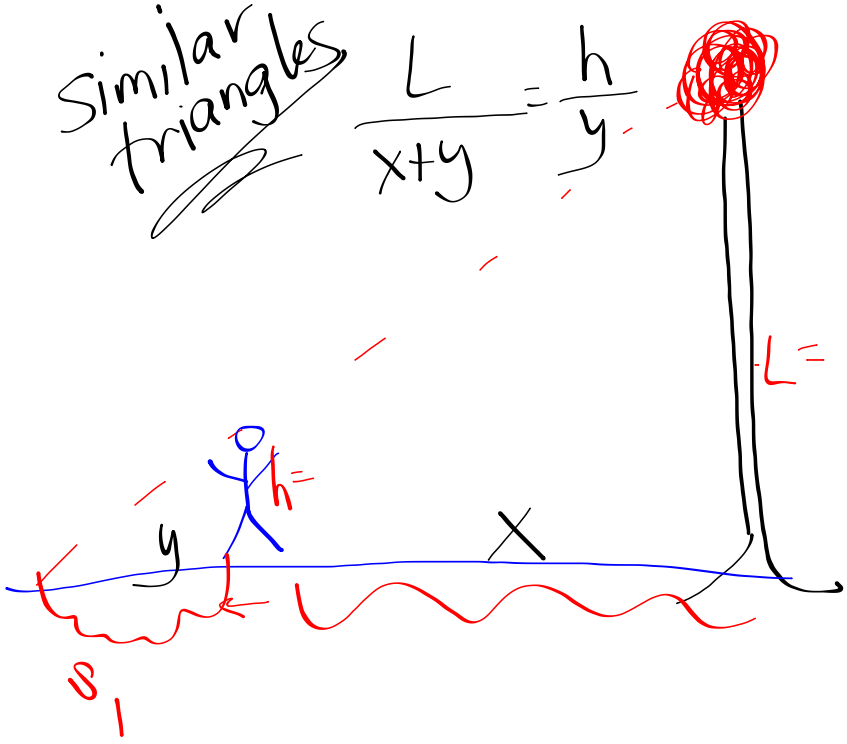
Similar triangles $\frac{L}{x+y} = \frac{h}{y}$



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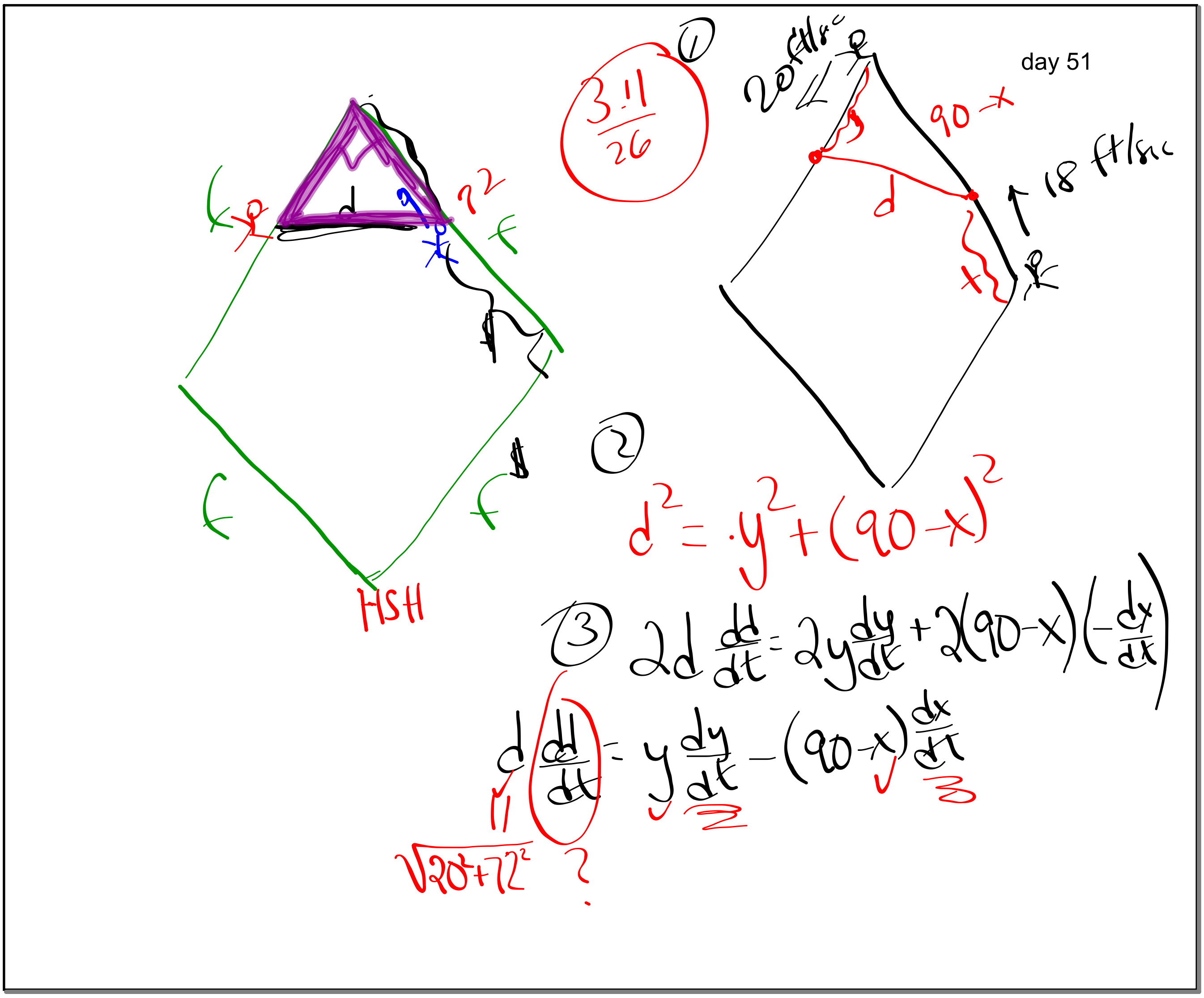
day 51
① 20 ft/sec
90 − x
d
18 ft/sec
x
3.11/26
HSH
②
$d^2 = y^2 + (90-x)^2$
③ $2d\frac{dd}{dt} = 2y\frac{dy}{dt} + 2(90-x)\left(-\frac{dx}{dt}\right)$
$d\frac{dd}{dt} = y\frac{dy}{dt} - (90-x)\frac{dx}{dt}$
$\sqrt{20^2+72^2}$?

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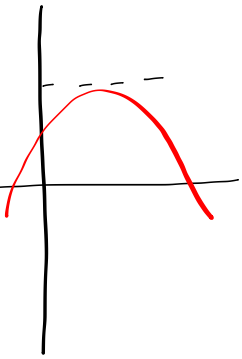
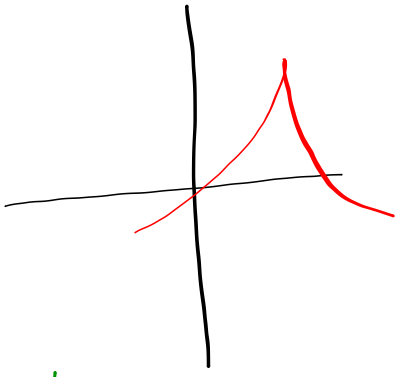
Recall in 4-1

Maxima/Minima

day 51

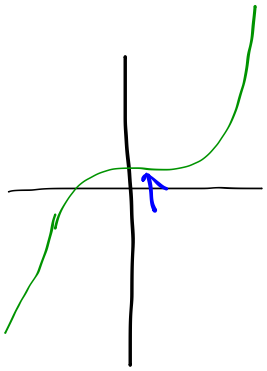
MAX: Y
1 derv: 0



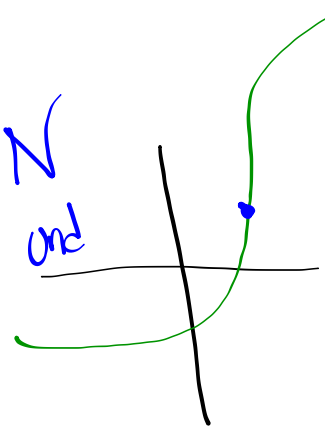


MAX: Y
1st deriv: und.

MAX: N
1 derv: 0



MAX: N
1st deriv: und



day 51

If $f'(a) = 0$ or $f'(x)$ is undefined at $x = a$

then

$x = a$ is called a critical

and $f(x)$ may have an extreme value there (max or min).

How do I know?

extreme values MUST happen at critical points or endpoints

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ABSOLUTE/GLOBAL MAX
VS
LOCAL/RELATIVE max

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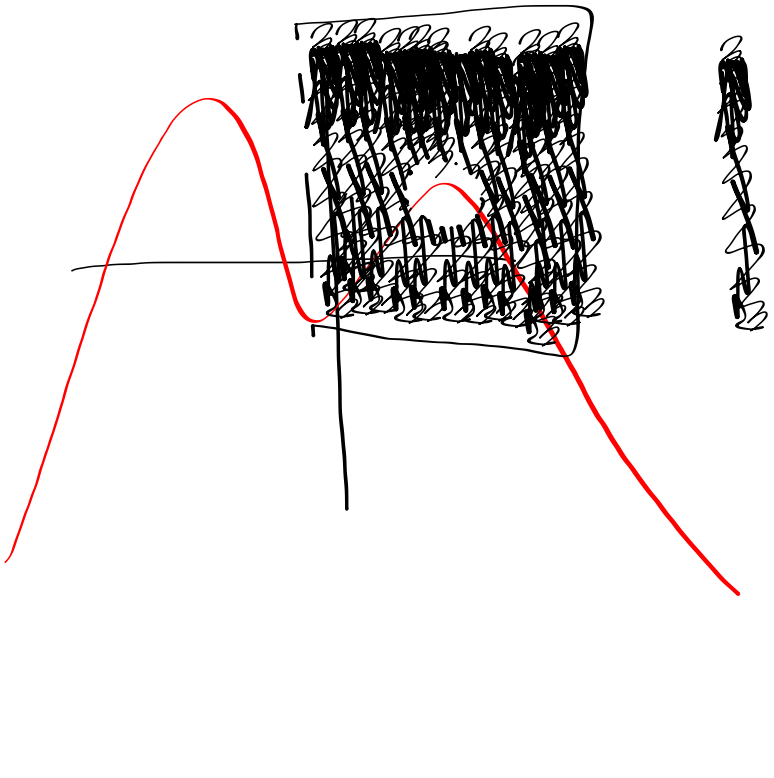

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